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(54) Title: DATA INFORMATION DISK CARTRIDGE AND METHOD OF ASSEMBLY AND USE			
(57) Abstract A protective cartridge for a data information disk comprising a disk containing case and a door moveable on said case between a closed position covering the disk and an open position for exposing the disk during a read operation. The door is supported on a subassembly comprising a slider, a support rod upon which said slider is mounted, and a biasing spring for urging the slider toward a door closing position. The subassembly is mountable as a unit with easy snap action engagement into said case. The cartridge case further is defined by a base and a pivotal cover that have respective interengageable latch members which, for purposes of security, can be disengaged only by means of pre-formed pins or tools inserted into respective access apertures formed in a bottom wall of the cartridge.			

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DATA INFORMATION DISK CARTRIDGE
AND METHOD OF ASSEMBLY AND USE

FIELD OF THE INVENTION

5 The present invention relates generally to cartridges for data information disks, and more particularly, to cartridges which protectively contain the disk during handling and storage and which, during use, can be inserted directly into a disk drive of an 10 optical reader/writer, and as an incident thereto, a sliding door of the cartridge is opened to expose portions of the disk to the reader/writer.

BACKGROUND OF THE INVENTION

15 Data information disks are being developed for storing increasingly large amounts of information, which can be used for data processing, high quality musical and video transmission, and other business and entertainment purposes. A growing need exists for 20 protecting the disks during storage, handling and usage. Even small defects or contamination can significantly affect output and use of the massive information contained on the disk.

In commercial establishments which rent such 25 disks to the public, it is desirable that the cartridges prevent access to the disk by the rental customer in order to minimize tampering, contamination, or other damage to the disk. On the other hand, because of the large numbers of disks 30 carried in inventory by such commercial establishments, it is desirable that the disk be removable from the cartridge upon return to the rental store for storage without the cartridge, thereby substantially reducing the necessary inventory and

space requirements for such cartridges. Indeed, the number of cartridges in inventory then need only correspond to the rental volume, and not to the inventory of disks.

5 Likewise, when such disks contain confidential and proprietary business information, the need exists for cartridges which prevent access to and removal of the disk from the cartridge by unauthorized personnel, but which enable relatively easy access by authorized 10 personnel. On the other hand, non-business consumer purchasers of compact disks generally prefer storing the disks in cartridges designed for easy access for disk removal, replacement, or substitution.

From a manufacturing standpoint, the need exists 15 for the cartridge to be susceptible to automated assembly, through use of robots and other automatically controlled assembly mechanisms. Due to the multiplicity of parts and the complexity of design of existing data information disk cartridges, 20 heretofore such cartridges have not lent themselves to easy or automated assembly. The desire for cartridges with specific features for particular usage, such as the ability to prevent unauthorized access to the disk and/or permanently contain the disk, or the ability to 25 permit easy opening to the cartridge by a consumer/user, further necessitates customized manufacture and increased production costs.

OBJECTS AND SUMMARY OF THE INVENTION

30 It is an object of the present invention to provide a data information disk cartridge adapted for more effective and efficient usage by commercial establishments, and particularly those which rent such disks to the general public.

Another object is to provide a data information disk cartridge as characterized above which prevents access to a contained disk by unauthorized personnel, while enabling easy access and removal of the disk by 5 authorized personnel.

A further object is to provide a cartridge of the above kind that gives the user a perception of permanently containing a disk, while at the same time enabling authorized persons easy access for disk 10 removal and replacement. A related object is to provide a cartridge which has a pivotally mounted cover with a latching arrangement that is neither visible nor apparent to unauthorized users of the cartridge.

15 Still another object is to provide such a data information disk cartridge that requires a pre-formed key or actuating apparatus for enabling access to a contained disk.

Yet another object is to provide a disk cartridge 20 of the foregoing type that lends itself to efficient manufacture and automated assembly.

Another object is to provide a method of making a data information cartridge wherein a relatively small tooling change in the base latching mechanism results 25 in a cartridge with a cover that permits easy manual opening and closing, or a cartridge which gives the user the perception of permanently containing the disk and which requires a special tool or key for opening.

A further object is to provide a cartridge with a 30 sliding door mounting structure that lends itself to easier automated assembly.

Another object is to provide such a cartridge in which the sliding door mounting structure permits more reliable door movement between opening and closing

positions on either side of an access opening of the cartridge.

Other objects and advantages of the invention will become apparent upon reading the following 5 detailed description and upon reference to the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a top plan view of an illustrative 10 data information disk cartridge in accordance with the invention, with a portion broken away to show the cover latching mechanism;

FIG. 2 is a perspective of the cartridge shown in FIG. 1, but with the cover of the cartridge in an open 15 position and an optical data information disk, depicted in phantom, shown in exploded relation to the cartridge;

FIG. 3 is an exploded perspective of the illustrated cartridge;

20 FIG. 3a is a perspective of the cartridge cover in upside down relation to show its underside;

FIGS. 4 and 5 are enlarged fragmentary sections taken in the planes of line 4-4 and 5-5 in FIG. 1;

25 FIG. 6 is an enlarged, horizontal fragmentary section of the manually operable cover latching mechanism of the illustrated cartridge, showing the latch in a locked position;

FIG. 7 is a fragmentary vertical section, taken in the plane of line 7-7 in FIG. 6;

30 FIG. 8 is a horizontal section, similar to FIG. 6, but showing the cover latch in an unlocked position;

FIG. 9 is an exploded perspective illustrating the assembly of the door supporting slider of the

illustrated cartridge onto its support and guide rod;

FIG. 10 is an enlarged vertical section of the slider support and guide rod, taken in the plane of line 10-10 in FIG. 9;

5 FIG. 11 is an exploded perspective showing assembly of slider return springs into the support and guide rod following assembly of the slider thereon;

FIG. 12 is a perspective showing assembly of the support and guide rod, slider, and spring subassembly 10 into a base of the illustrated cartridge;

FIG. 13 is an enlarged fragmentary section taken in the plane of line 13-13 in FIG. 12, showing assembly of the slider support and guide rod into the base of the cartridge;

15 FIG. 14 is a partial end view of the cartridge base and slider support and guide rod, taken in the plane of line 14-14 in FIG. 13;

FIG. 15 is a fragmentary section of the support and guide rod assembled in the cartridge base, taken 20 in the plane of line 15-15 in FIG. 13;

FIG. 16 is an exploded perspective showing assembly of the door onto the cartridge;

FIG. 17 is an exploded perspective showing assembly of an alternative one-piece form of door onto 25 a cartridge having an alternative form of cover latching mechanism which requires a special tool or key for opening;

FIG. 18 is an enlarged horizontal section of the cover latching mechanism of the cartridge shown in 30 FIG. 17;

FIG. 19 is a vertical section taken in the plane of line 19-19 in FIG. 18, illustrating the cartridge being lowered onto a cover unlatching tool shown in phantom;

FIG. 20 is a vertical section, similar to FIG. 19, showing the cartridge fully positioned on the unlatching tool;

FIG. 21 is a perspective of an automated cover 5 unlatching fixture for the cartridge shown in FIGS. 17;

FIG. 22 is a side elevational view of a cover lifting fixture for opening and closing the cover during automated assembly of a disk therein;

10 FIG. 23 is an exploded perspective of a cartridge having an alternative form of door supporting slider arrangement according to the present invention;

FIG. 24 is a fragmentary vertical section of the cartridge shown in FIG. 23 with the door in a closed 15 position;

FIG. 25 is a fragmentary vertical section, similar to FIG. 24, showing the door in an open position; and

20 FIG. 26 is an enlarged fragmentary section taken in the plane of line 26-26 in FIG. 24.

While the invention is susceptible of various modifications and alternative constructions, certain illustrated embodiments thereof have been shown in the drawings and will be described below in detail. It 25 should be understood, however, that there is no intention to limit the invention to the specific forms disclosed, but on the contrary, the intention is to cover all modifications, alternative constructions and equivalents falling within the spirit and scope of the 30 invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to FIGS. 1-3 of the drawings, there is shown an illustrative

protective cartridge 10 for use with a re-writable optical disk having alpha numeric data recorded thereon. The cartridge 10 comprises a disk containing case defined by a base 12 and a cover 14 mounted for 5 pivotal movement on the base 12 between an open position for permitting insertion and removal of a disk 15 into the cartridge (as depicted in FIG. 2) and a closed position for protectively containing the disk. The base 12 and cover 14 each are formed with a 10 respective access aperture 18, 19, and a door 20, which is mounted on a slider 21 and has a pair of shutters 24, 25, is moveable between a closed position where the shutters 24, 25 cover the access apertures 18, 19 and an open position to either side of the 15 access apertures. In some respects, the cartridge 10 is similar to that disclosed in Sandell et al. U.S. application Serial No. 08/643,001, the disclosure of which is incorporated herein by reference.

The base 12, which is preferably plastic 20 injection molded, is generally rectangular in shape and includes a bottom wall 26, upstanding side walls 28, and forward and rear ends 29, 30, respectively. A semicircular wall or rib 31 extends in upstanding relation to the bottom wall 26, which together with 25 the rear cartridge end 30, defines a pocket for the disk. The access aperture 18 in the base 12 is formed in the bottom wall 26 and is generally U-shaped, having a cylindrical end 32 coaxial with a contained disk and a forwardly extending channel portion 34, 30 which in this instance, is slightly greater in width than the diameter of the cylindrical end 32.

The base 12 further defines a pair of pockets or recesses 35 in its underside adjacent the rearward end thereof for containing respective write protector

switches 36 of a conventional type (FIG. 1). For retaining the write protector switches 36 within the recesses 35 and for defining a guide groove for the door shutter 24, the base 12 in this instance has a 5 retainer plate 38 sonically welded transversely across its rearward underside. The retainer plate 38 and the upper side of the base 12 are formed with transverse slots 39 adapted for receiving and guiding a respective upwardly extending pin 40 of the protector 10 switches 36. The rearward end of the cover 14 is narrowed to define a rearwardly extending rectangular section 42 adapted for receipt within a recessed area of the rear casing end 30 between the write protector switches 35 in co-planer relation with the top surface 15 of the base.

The cover 14 is defined by a generally rectangular plastic injected molded plate, with the access aperture 19 therein being shaped complementary to the access aperture 18 of the base 12 and extending 20 through a forward end of the cover. For hingedly supporting the cover 14 for pivotal movement relative to the base 12, the base 12 is formed with a plurality of laterally spaced, horizontally disposed, hinge pins 44 in upstanding relation to the bottom wall 26 of the 25 base and the cover 12 is formed with a corresponding number of integrally formed C-shaped retainers 45 (FIGS. 3 and 4). The C-shaped retainers 45 in this instance are designed to extend about 270 degrees about the hinge pins 44 so as to define a pin 30 receiving opening that enables the plastic retainers 45 to be forced over the hinge pins with resilient snap action, such that when mounted, the C-shaped retainers 45 are captively, but pivotally, secured to the hinge pins 44. For enhanced support of the cover

12, pairs of door supporting hinge pins 44 are disposed on opposite sides of the access apertures 18, 19.

In accordance with an important aspect of the invention, the door supporting slider is mounted for movement between door opening and closing positions on a relatively simple and easy to assembly support and guide rod. In the illustrated embodiment, the slider 21 is mounted on a transversely disposed tubular support and guide rod 50 by means of axially aligned apertures 51 formed in depending mounting flanges 52 located at opposite ends of the shutter 21. The support and guide rod 50 in this case is disposed within a pair of forwardly opening channels 55 formed 15 in the forward end 29 of the base 12 on opposite sides of the access apertures 18, 19. The channels 55 are interconnected by a rigidifying plate 54 extending between end walls of the channels 55 in a central plane of the cartridge (FIG. 12). For supporting the 20 rod 50 within the channels 55, forwardmost ends of the base side walls 28 are formed with rod receiving apertures 56 (FIGS. 12-15). It will be understood that the sides 28 of the cartridge base 12 in which the rod mounting apertures 56 are located have sufficient resiliency so as to permit snap action 25 mounting of the support rod 50 into the apertures 56.

In keeping with the invention, the support and guide rod is formed with a longitudinally extending slot 58 on a forward side thereof for receiving a 30 depending guide flange 59 of the slider 21, which rides in the slot 58 and guides movement of the slider 21 and door 20 along the rod 50 (FIGS. 5, 9, 10). In order to properly orient the support and guide rod 50, the rod mounting apertures 56 have ribs 60 on top and

bottom sides thereof which are respectively engageable in the guide slot 58 and a diametrically opposed locating slot 61 formed in each end of the rod 50, as depicted in FIGS. 13-15.

5 For further facilitating and guiding movement of the slider 21 relative to the base 12, the slider 21 is formed with guide surfaces 64 on opposite sides thereof, including side walls of the mounting flanges 52, which are guided by forwardly extending legs 65 of 10 the channels 55 (FIGS. 4 and 4). The slider 21 further is formed with transversely extending guide flanges 66 on opposite sides thereof which extend the length of the slider and ride on end surfaces of the channel legs 65. The transverse guide flanges 66 in 15 this instance have side peripheral edges in substantial co-planar relation with the top and bottom sides of the base 12.

For biasing the slider 21 and door 20 mounted thereon to a central closed position, a pair of return 20 springs 68 are compressively contained in opposite ends of the support and guide rod 50. The return springs each are secured at an outer end by respective inwardly extending angled barbs 69 (FIG. 15) formed adjacent the support and guide rod 50 and are biased 25 against respective sides of the inwardly extending V-shaped barbs 70 (FIG. 10) formed in the center of the guide rod 50. By virtue of the orientation of the angled barbs 69 with their ends extending toward the center of the tube, it can be seen that the return 30 springs 68 can be assembled into the tube from an end thereof, with the barbs 69 securing the springs against outward movement. The central barbs 70 extend into the tube from opposite sides thereof so as to define stops for the return springs 68, while being

spaced apart from each other sufficient to allow passage of the slider guide flange 59 (see FIG. 5 for example). Hence, it will be seen that when the slider 21 moved in one direction, the guide flange 59 will engage the return spring 68 on the side to which the slider is being moved to further compress the spring, while the spring on the opposite side will remain in a biased condition against the central barbs 70. Likewise, movement in the slider 21 in the opposite direction, will cause the guide flange 59 to engage and further compress the opposite return spring 68, while the spring on the other side will remain in a compressed state against the central barbs 70. Thus, upon release of the slider 21 following movement in either direction, the respective return spring 68 engaged and compressed by the slider 21 will cause return of the slider 21 and door 20 to its central door closing position as shown in FIG. 1.

In order to enable simple snap action mounting of the door 20 onto the slider 21 following assembly of the support and guide tube 50, slider 21, and return springs 68 in the cartridge base 12, the slider 21 is formed with pairs of locking grooves 72 in opposite sides thereof and a depressible lever arm 74 with an upstanding locking button 75 disposed centrally between the locking grooves 72 (FIG. 9). The door 20 in turn is formed with pairs of inwardly directed locking ledges 76 in the sides thereof and an aperture 78 located centrally in the outwardly exposed end thereof (FIGS. 4-5). The door 20 may be positioned onto the slider 21 in offset longitudinal relation to the locking grooves 72 (i.e., to the left as viewed in FIG. 9) and then forced downwardly to depress the lever arm 74 and enable the slider 21 to be moved

longitudinally (to the right as viewed in FIG. 9) such that the locking ledges 76 enter the locking grooves 72. Upon reaching the properly mounted position, the depressed lever arm 74 will urge the locking button 75 5 into the door aperture 78 to retain the door 20 in mounted position (FIG. 5). It will be understood by one skilled in the art that while the illustrated door is shown to be mounted on a separate slider, alternatively, the door and slider could be integrally 10 formed. It will further be understood that the slider 21 and/or door 20 may be formed with appropriate shoulders or apertures, such as the shoulders 79 (FIG. 1), for engagement by the pin of the pivot arm of a disk reader for effecting movement of the slider 21 15 and door 20 in either opening direction as an incident to positioning of the cartridge into a disk reader.

To permit opening of the cartridge cover 14 after mounting of the door 20, the door shutter 25 in this instance is hinge-mounted for simultaneous pivotal 20 movement with the cover 14. The hinge mounting is defined by a series of axially aligned ball and socket joints defined by balls 80 formed on opposite sides of forwardly extending extensions 81 of the shutter which are engaged in sockets 82 formed in opposite sides of 25 rectangular extensions 84 of the main door structure (FIG. 3). For guiding sliding movement of the shutter 25 on the cover 14, a rectangular retainer plate 85 is fixed to the cover 14 in overlying relation to a rearward end of the shutter 25, which together with 30 the cover 14, defines a guide slot for the shutter 25.

To permit releasable securement of the cover 14 in closed position as on the base 12, the cartridge has latch portions or members which are adapted for easy manual disengagement. The illustrated cover 14

is formed with a pair of depending latch hooks 88 adapted for engagement with respective finger tab units 90 integrally formed with the base 12 on opposite sides thereof (FIGS. 6-8). Each finger tab unit 90 comprises a manually depressible and lever arm 91 which forms a part of the base side wall 28, with only a small interruption or gap 92 in the side wall 28. The lever arm 91 is formed with a transversely elongated aperture 93 in an end thereof which defines 10 a locking ledge 94 on an inner, underside thereof and which communicates with an elongated slot 95 along the side wall 28 for enhancing flexibility of the lever arm 91. When the cover 14 is in its closed position and each finger tab unit 90 is in a relaxed state, and 15 the latch hooks 88 of the cover 14 extend through the lever arm aperture 93 and beneath the locking ledge 94 thereof, as depicted in FIGS. 6 and 7, securing the cover 14 in closed position. By squeezing the finger tab units 90 between the thumb and finger of one hand, 20 the levers 91 are flexed inwardly to move the locking ledges 94 inwardly from beneath the latch hooks 88, as shown in FIG. 8, thereby releasing the cover 14 and permitting it to be pivoted to an open position. Returning the cover 14 to a closed position will cause 25 the latch hooks 88 to engage the finger units 90 and momentarily cam the levers 91 inwardly to allow the latch hooks 88 to pass the ledges 94, after which the levers 91 spring outwardly to cause the locking ledges 94 to move into engagement with the latch hooks 88.

30 In keeping with the invention, the cartridge, including the slider support and guide mechanisms, lends itself to efficient manufacture and assembly and can be adapted, with relatively small change, to effect product feature variations. At the outset,

each component of the cartridge 10 (except for the compression springs 68 and support and guide rod 50 which may be metal), are economically manufacturable by plastic injection molding. The components, 5 furthermore, lend themselves to efficient preliminary and final assembly. A first subassembly can be produced by assembling the write protector switches 36 into the pockets 35 of the base 12, and sonically welding the retainer 38 in place on the base over the 10 write protector switches. A second subassembly can be produced by sonically welding the retainer 85 over the cover 14, and a third subassembly can be produced by positioning the slider 21 onto the support and guide tube 50, and assembling springs 68 into opposite ends 15 of the tube. Final assembly can be effected by (1) snapping the slider 21, tube 50 and spring 68 subassembly into the base 12; (2) snapping the cover 14 onto the hinge pins 44 of the base 12, and (3) positioning the door 20 over the slider 21 and then 20 longitudinally moving the door 20 into snap action engagement therewith. It will be understood that while the illustrated cartridge 10 has been shown with a door 20 that is slidable in either direction with respect to the access openings 18, 19, the cartridge 25 can be easily modified to effect door movement in only one direction, such as by eliminating a guide channel 55 and/or compression spring 68 on one side thereof.

In keeping with a further important aspect of the invention, only a small design and manufacturing 30 change is necessary for converting the cartridge from one in which the cover 14 is easily, manually releasable, as heretofore described, to a cartridge which precludes unauthorized opening of the cover and which gives the user a perception of permanently

containing the disk. To effect such product change, the tooling for the cartridge base 12 need only be slightly modified to eliminate the gap 92 in the side wall 28, to form a gap 96 in the end of the lever arm 91, and to form an access opening 98 in the base 91, beneath the gap 96, as depicted in the cartridge 10a illustrated in FIGS. 17 and 18, wherein items similar to those described above have been given similar reference numerals with the distinguishing suffix "a" added. Such design changes result in a locking ledge defining lever arm 91a that is separate from the side wall 28 and is neither accessible, nor visible from a side of the container. In such modified cartridge 10a, the cover 14a similarly is latchedly secured in its closed position by engagement of the hooks 88a thereof with locking ledges 94a of the lever arm 91a. Since the sides 28 of the cartridge base are not deflectable, nor directly coupled to the moveable end of the lever arms 91a, manual disengagement of the latches is neither possible for the sides of the cartridge, nor apparent. Hence, the cartridge 10a has particular utility in rental stores in which there is a desire to prevent the public from obtaining access to the contained disk, which can contaminate or otherwise damage the disk. Likewise, such cartridges 10a have particular utility for businesses in which handling of disks containing confidential information is restricted to authorized personnel.

In carrying out the invention, the cartridge 10a is adapted for easy unlatching and opening by authorized personnel using a pre-formed tool or fixture. Referring to FIGS. 19 and 20, there is shown a relatively simple, inexpensive tool 100, such as might be used in a rental store, which comprises a

platform or base 101 with a pair of upstanding pins 102 having a lateral spacing corresponding to the spacing between the access apertures 98 in the base 12a of the cartridge. Each pin 102 has an inclined 5 camming surface 104 on an inner side thereof. It will be seen that by merely positioning the cartridge 10a onto the tool 100 with the pins 102 extending upwardly into the apertures 98, such as can be easily effected by a store clerk, the camming surfaces of the pins 102 10 will be moved into engagement with the ends of the lever arms 91a causing the lever arms 91a to be moved inwardly from their locking position (shown in FIG. 19) to a position in which the locking ledges 94a of the pivotal arms 91a are removed away from the hooks 15 88a (as depicted in FIG. 20), releasing the cover 14a and permitting it to be pivoted to an open position. While such unlatching may be simply and easily accomplished, it may be done only by personnel possessing the tool, thereby enabling rental stores 20 and businesses to restrict handling of the contained disks to authorize personnel.

In further keeping with the invention, to enable automated and high volume assembly of disks into cartridges in a manufacturing line, an automated 25 unlatching fixture 105 may be provided, as depicted in FIGS. 21-22. The fixture 105 in this case has a base or platform and a pair of upstanding pins 106 which are laterally moveable with respect to each other by a respective air cylinder 108. Upon positioning of the 30 cartridge 10a onto the fixture, such as by an automated robot, with the pins 106 extending upwardly into the base apertures 98, the cylinders 108 may be actuated to move the pins 106 inwardly toward each other, thereby moving the pivot arms 91a to their

unlocking positions. An automatically operated pivotal arm 110 with a suction head 111 at an end thereof, as depicted in FIG. 22, may be lowered in to engage the cover 14a by the suction head 111, and then raised to lift the open position for permitting automated assembly of a disk into the cartridge, after which pins 106 are returned to their original positions and the arm 110 is lowered to close and latch the cover 14a.

10 It will be understood by one skilled in the art that the cover latching arrangement of the cartridge 10a gives the user of the cartridge the perception that the cartridge is a permanent container for the disks. Hence, it may be desirable that the cartridge 15 door not have a hinged shutter, which might tend to encourage a user to attempt unauthorized opening of the cartridge. Consistent with the present invention, the assembly of the cartridge 10a with such a door is easily accomplished by assembling onto the cartridge a 20 one-piece non-pivotal shutter door 20a, in lieu of a hinged shutter door 20, as depicted in FIG. 17.

Referring now to FIGS. 23-26, there is shown a cartridge 106 having an alternative door mounting structure, wherein items similar to those described 25 above have been given similar reference numerals with the distinguishing suffix "b" added. The cartridge 106 in this case has a door supporting slider 21b formed with a mounting opening 51b extending through the length thereof for positioning onto a solid 30 support rod 50b. The support rod 50b has reduced diameter ends 115 for snap action positioning within mounting apertures 56b in the base sidewalls 28b. The door 20b is adapted for snap action mounting on the slider 21b by means of depending locking tongues 116

of the doors that are positionable into a camming and locking grooves 118 formed in the end of the slider 21b in a manner similar to that disclosed in the above referenced application Serial No. 08/643,001.

5 For guiding movement of the door mounting slider 21b on the support rod 50b, the slider has side guide surfaces 64b and transverse guide flanges 66b, similar to the slider described above. Depending flanges 52b at opposite ends of the slider 21b each is formed with 10 guide slot 119 which straddles the central rigidifying plate 54b of the base 12b as the slider 21b is moved in either direction with respect to the access openings 18b, 19b.

For biasing the slider 21b to a central door 15 closing position, a pair of slide actuators 120 are slidably mounted on the support rod 50b on opposite sides of the slider 21b. The actuators 120 in this case each have a generally L-shaped configuration defined by an upper portion 121 formed with a rod- 20 receiving aperture 122 and a depending leg 124. The upper portion 121 of each actuator 120 has an inwardly directed tapered end 125 engageable with a respective tapered recess 126 on the end of the slider 21b which guides the actuator into predetermined mating relation 25 with a slider to facilitate movement therebetween.

For biasing the actuators 120 into engagement with opposite sides of the slider 21b when in a central door closing position, an extension spring 130 is connected between depending hooks 131 of each actuator 30 120 on the underside thereof. The spring 130 in this case is stretched along the underside of the slider 21b, with slots 119 in the depending flange 52b permitting free movement of the slider over to the spring 130.

For limiting movement of the actuators 120 while permitting free movement of the slider 21b, stops 134 in the form of upstanding laterally spaced ribs are located adjacent opposite sides of the rigidifying plate 54b. The depending legs 124 of the actuators 120 are adapted for engaging the stops 134 to limit movement, while the slots 119 in the depending flanges 52b of the slider 21b are of sufficient width to permit passage of the slider 21b over the stops 134 in either direction.

It will be seen that regardless of the direction in which the slider 21b is moved relative to the access openings 18b, 19b, the extension spring 130 is extended to provide force for returning the slider 21b to its central closing position upon release. For example, when the slider 21b is moved to the right, as depicted in FIG. 25, such as an incident to positioning of the cartridge into a optical disk reader, the slider 21b will force and move the actuator 120 on the right-hand side thereof, while movement of the opposite actuator 120 is restrained by stops 134, thereby further stretching the return spring 130 (as shown in FIG. 25) and providing the force for return of the slider 21b and door 20b to the central closed position. Likewise, movement of the slider and doors 21b and 20b in the opposite direction, will cause the slider 21b to move the adjacent actuator to the left, as viewed in FIG. 24, while the other actuator is restrained by stops 134, again stretching the return spring.

The door supporting mechanism for the cartridge 106 again lends itself to efficient preliminary and final assembly. A slider and support rod subassembly may be readily produced by positioning the slider 21b

onto the support rod 50b, positioning the slide actuators 120 onto opposite ends of the support rod 50b, and then positioning the spring 130 over the hooks 131 of the slide actuators 120. The slide and support rod subassembly may then be assembled into the cartridge base 12b by snapping the ends of the support rod 50b into the side wall apertures 56b. The door 20b, of desired design, may thereafter be assembled on and snapped into engaging relation with the slider 10 21b.

From the foregoing, it can be seen that the data information cartridge of the present invention is adaptable for more effective and efficient usage by commercial establishments by preventing access and handling of contained disks by unauthorized personnel, while enabling easy access and removal of disks by authorized personnel. The cartridge lends itself to efficient manufacture and automated assembly, with relatively small design and tooling changes enabling selective production of cartridges with manually releasable access covers or cartridges which gives a user the perception of being a permanent container for the disk and which require a special tool or fixture for opening. The cartridge door mounting structure also facilitates reliable movement of the door between opening and closing positions while lending itself to both automated subassembly and final assembly into the cartridge.

What is claimed is:

1. A protective cartridge for a data information disk comprising a case which defines a compartment for 5 enclosing and containing a disk, a sliding door moveable from a closed position covering said disk to an open position for exposing said disk during a read operation, said door having at least one shutter overlapping an outer planar surface of said case and a 10 slider for supporting said disk for movement relative to said case, a slider support rod mounted in an end of said case, said slider having at least one mounting aperture through which said support rod extends for supporting said slider for relative movement, and at 15 least one return spring biasing said door in a closing direction when moved to the open position.

2. The protective cartridge of claim 1 in which said slider includes a guide flange, and said rod is formed with a longitudinal groove for receiving said 20 guide flange and guiding movement of the slider relative to said rod.

3. The protective cartridge of claim 2 in which said rod is a hollow tube.

4. The protective cartridge of claim 1 in which 25 said rod is a hollow tube and said return spring is disposed within said tube.

5. The protective cartridge of claim 4 in which said slider includes a guide flange, and said rod is formed with a longitudinal groove for receiving said 30 guide flange and guiding movement of the slider relative to the rod.

6. The protective cartridge of claim 5 in which said slider guide flange is operable for compressing said return spring as an incident to movement of said

door to said open position.

7. The protective cartridge of claim 1 in which said case is formed with at least one aperture on a side thereof for permitting access to a disk contained 5 therein when said door is in an open position, said door being moveable on said rod to either side of said access aperture, and including a pair of said return springs, one of said return springs being compressed as an incident to movement of said door in one 10 direction relative to said access aperture and the other of said return springs being compressed as an incident to movement of the door to the other side of said access aperture.

8. The protective cartridge of claim 7 in which 15 said rod is a hollow tube, and said return springs each are disposed in a respective end of said tube.

9. The protective cartridge of claim 4 in which said spring is mounted in said rod in a pre-compressed condition, and said spring is compressed further 20 within said rod as an incident to movement of said door to said open position.

10. The protective cartridge of claim 9 in which said rod includes a pair of stops, one of said stops being adjacent an end of said rod and the other of 25 said stops being located intermediate the ends thereof, and said spring being maintained in a pre-compressed condition between said stops when said door is in a closed position, and said spring being further compressed by said door against said one stop as an 30 incident to movement of said door to said open position.

11. The protective cartridge of claim 4 in which said case is formed with at least one access aperture, and said door being moved to an open position on

either side of said access aperture, and including a pair of return springs, said rod having inwardly extending stops at opposite ends thereof and a centrally located stop intermediate the ends thereof, 5 and when said door is in said closed position one of said return springs is held in compressed condition between the centrally located stop and the stop adjacent one end of the rod and the other spring is held in compressed condition between the centrally 10 located stop and the stop adjacent the opposite end of said rod, and when said door is moved to one side of said access aperture one of said return springs is further compressed as an incident to such movement, and when said door is moved to an opposite 15 side of said access aperture the other of said return springs is further compressed as an incident of such movement.

12. The protective cartridge of claim 11 in which said stops are inwardly depressed barbs of said 20 tubular rod.

13. The protective cartridge of claim 1 in which said rod is mounted for snap action engagement with said case.

14. The protective cartridge of claim 13 in 25 which said case has side walls formed with apertures each for receiving a respective of said rod.

15. The protective cartridge of claim 2 in which said case has side walls formed with rod receiving apertures and at least one of said receiving apertures 30 having a rib extending in the aperture for locating the rod in predetermined relation to said case with said guide groove facing outwardly.

16. The protective cartridge of claim 1 in which said case is defined by a base and a cover mounted for

pivotal movement relative to said base between a closed position for containing a disk and an open position for permitting insertion and removal of a disk, said rod and case defining a snap action 5 engageable mounting for said rod, and said cover and base defining a snap action engageable mounting for said cover, and said door and slider defining a snap action engageable mounting for said door.

17. The protective cartridge of claim 1 in which 10 said slider is formed with a pair of depending mounting flanges each having a respective aperture for positioning over said rod.

18. The protective cartridge of claim 1 in which said case is formed with at least one outwardly 15 opening channel, said rod extending along said channel, and said slider being mounted for movement in said channel.

19. The protective cartridge of claim 18 in which said channel of said case defines forwardly 20 extending legs for guiding movement of said slider in said channel.

20. The protective cartridge of claim 19 in which said case is formed with at least one access aperture that is covered by said door when in a closed 25 position, and said case is formed with a pair of said outwardly opening channels disposed on opposites of said access aperture within which said slider is moveable.

21. The protective cartridge of claim 20 in 30 which said channels have forwardly extending legs, and said slider having side surfaces that are guided by said channel legs and transverse flanges that are moveable on end surfaces of said channel legs.

22. The protective cartridge of claim 1

including a pair of slide actuators mounted on said support rod on opposite sides of said slider for relative sliding movement with respect to said support rod, and said return spring being connected in tension 5 between said actuators.

23. The protective cartridge of claim 22 in which one of said slide actuators is moveable with said slider and door as an incident to movement of said door to an open position while the other of said 10 slide actuators is restrained from movement.

24. The protective cartridge of claim 22 in which said return spring draws said slide actuators into engagement with opposite sides of said slider when said door is in a closed position.

15 25. The protective cartridge of claim 22 in which said case is formed with at least one access aperture, said slider and door being moveable relative to said rod to an open position on either side of said access aperture, and said slider simultaneously moves 20 one of said slide actuators along said support rod to increase tensile forces on said spring when said door is moved to an open position adjacent one side of said access aperture, and said slider moves the other slide actuator in an opposite direction to increase the 25 tensile force of said spring when said door is moved to an open position on an opposite side of said access aperture.

26. The protective cartridge of claim 25 including a first stop for limiting movement of said 30 one actuator when the door is moved to an open position on one side of said access aperture and a second stop for limiting movement of said other actuator when said door is moved to an open position on the opposite side of an access aperture.

27. The protective cartridge of claim 26 in which said stops are formed on said case.

28. The protective cartridge of claim 22 in which said slide actuators each have a depending flange, and said spring is secured between said depending flange in outwardly spaced relation to said rod.

29. The apparatus of claim 27 in which said slider is formed with at least one groove through which said spring extends for enabling relative movement of slider with respect to said spring.

30. A protective cartridge for a data information disk comprising a case having a base and cover which define a compartment for enclosing and containing a disk, a door mounted for sliding movement on said base between a closed position covering said disk to an open position for exposing said disk during a read operation, said cover being mounted on said base for pivotal movement between a closed position for containing a disk and an open position for permitting insertion and removal of a disk, said base and cover each having at least one latch portion, one of said latch portions being moveable between a first position for latchedly engaging the other latch portion when said cover is in a closed position and a second position in disengaged relation to the other latch portion for permitting pivotal movement of said cover to an open position, and an access aperture in the base through which said moveable latch portion is selectively engageable for enabling movement thereof from said first position to said second position.

31. The protective cartridge of claim 30 in which said cartridge base includes a pair of side walls, and said moveable latch portion being located

in said case in inwardly adjacent relation to a side wall of such base so as to be neither visible nor engageable from a side of the cartridge case.

32. The protective cartridge of claim 31 in 5 which said moveable latch portion is disposed in generally parallel relation to the adjacent side wall and is moveable transversely with respect thereto.

33. The protective cartridge of claim 30 in 10 which said moveable latch portion is a pivotal member fixed at one end within said case with the other end being moveable.

34. The protective cartridge of claim 33 in 15 which said other latch portion includes a tapered camming surface for engaging and urging said moveable latch portion from said first position to said second position as an incident to movement of said cover to said closed position.

35. The protective cartridge of claim 30 in 20 which said base has a bottom wall and side walls in upstanding relation to said bottom wall, and said access aperture is formed in said bottom wall.

36. A protective cartridge for a data 25 information disk comprising a case having a base and a cover for defining a compartment for enclosing a disk, said base having a bottom wall and side walls in upstanding relation to said bottom wall, a door mounted for sliding movement on said base between a closed position covering said disk to an open position for exposing said disk during a read operation, said 30 cover being mounted on said base for pivotal movement between a closed position for containing a disk and an open position for permitting insertion and removal of a disk, said base and cover each having at least one latch member, one of said latch members being moveable

between a first position for latchedly engaging the other latch member when said cover is in a closed position and a second position in disengaged relation to the other latch member for permitting pivotal movement of said cover to an open position, and said base having an access aperture in said bottom wall for enabling selected engagement and movement of said moveable latch member from said first position to said second position.

10 37. The protective cartridge of claim 36 in which said moveable latch member is located in said case in inwardly adjacent relation to said one of side walls so as to be neither visible nor engageable from the side of the cartridge case.

15 38. The protective cartridge of claim 37 in which said moveable latch member is a pivot arm fixed at one end to said base, and said other latch member is a hook depending from said cover.

39. The protective cartridge of claim 38 in
20 which said bottom wall access aperture is located adjacent a moveable end of said pivot arm.

40. The protective cartridge of claim 36 in which said cover has a pair of said latch members adjacent opposite sides thereof, and said base being formed with a pair of latch members each for latchedly engaging a respective one of said cover latch members as an incident to movement of said cover to said closed position, and said cover bottom wall is formed with a pair of said access apertures each in aligned relation to one of said latch members.

30 41. The protective cartridge of claim 36 in which said cover is formed with a pair of latch hooks on opposite sides thereof, and said base being formed with a pair of said latch pivot arms each adapted for

latchedly engaging a respective one of said cover hooks as an incident to movement of said cover to said closed position, and said base bottom wall being formed with a pair of said access openings each 5 adjacent an end of a respective one of said pivot arms.

42. An apparatus for opening a data information disk cartridge having a base with a bottom wall and upstanding side walls and a cover mounted on said base 10 for pivotal movement between a closed position and an open position, said cover having a pair of laterally spaced first latch members and said base having a pair of laterally spaced second latch members each engageable with a respective one of said first latch members when said cover is in a closed position, one 15 of each said engageable first and second latch members being moveable between a first latch engaging position which secures said cover in locked position and a second latch disengaging position which permits 20 pivotal movement of the cover to said open position, and said base bottom wall being formed with a pair of laterally spaced access apertures adjacent said moveable latch members, said apparatus comprising a platform upon which said base bottom wall is 25 positionable, a pair of pins extruding in upstanding relation to said platform, said pins being spaced apart a distance corresponding to the spacing of said base bottom wall access apertures and being positionable into said access apertures upon 30 positioning of said bottom wall on said platform, and said pins being effective for moving said moveable latch members from their first position to their second position for disengaging the latch members and for permitting opening of said cartridge cover.

43. The apparatus of claim 42 in which said latch pins are operable as an incident to movement of said pins into said base bottom wall access apertures for simultaneously moving said moveable latch members 5 to their second position.

44. The apparatus of claim 42 in which said pins are fixedly mounted on said base, and said pins each being formed with a tapered camming surface for engaging a respective one of said moveable latch 10 members and camming the respective moveable latch members to a second position.

45. The apparatus of claim 42 in which said pins are moveable relative to said base following positioning of said pins into said bottom wall access 15 apertures for moving the moveable latch members to their second position.

46. The apparatus of claim 45 including selectively actuatable cylinders for moving said pins to their second position.

20 47. The apparatus of claim 45 in which said pins are moveable toward each following positioning thereof into said access apertures for moving said moveable latch members to their second position.

25 48. A method of loading a data information disk into a cartridge having a base with a bottom wall and upstanding side walls and a cover mounted on said base for pivotal movement between a closed position and an open position, said cover having a pair of laterally spaced first latch members and said base having a pair 30 of laterally spaced second latch members each engageable with a respective one of said first latch members when said cover is in a closed position, one of each said engageable first and second latch members being moveable between a first latch engaging position

which secures said cover in locked position and a second latch disengaging position which permits pivotal movement of the cover to said open position, and said base bottom wall being formed with a pair of 5 laterally spaced access apertures adjacent said moveable latch members, comprising the steps of positioning actuating pins into said access apertures, moving the moveable latch members to their second position by means of said actuating pins, pivoting the 10 cover to an open position, and inserting a cartridge into said case when said cover is in said open position, removing said actuating pins from said access apertures, and closing said cover on said base with said latch members in engaging relation.

15 49. The method of claim 48 including moving said moveable latch members to their second position as an incident to positioning of said actuating pins into access apertures.

50. The method of claim 49 including moving said moveable latch members to their second position by 20 engaging the moveable latch members with camming surfaces on said pins, and camming said moveable latch members as an incident to relative movement between said pins and moveable latch members.

25 51. The method of claim 48 including said moving said moveable latch members to said second positions by moving said actuating pins relative to each other.

52. The apparatus of claim 48 including opening said cover by engaging the cover with a suction head, 30 and lifting the suction head to pivot the cover relative to the base.

53. The apparatus of claim 48 including opening said cover by a suction head supported at the end of a pivot arm, and pivoting said pivot arm to raise the

suction head and cover.

54. The apparatus of claim 48 including positioning actuating pins into said access apertures by positioning the cartridge onto a platform from 5 which said pins extend upwardly.

55. A method of assembling a data information disk cartridge having a disk containing case and a spring biased door and slider mounted on a support rod for movement on said case between open and closed 10 positions comprising the steps of assembling the door onto the support rod, assembling at least one biasing spring on said support rod to form a subassembly comprising the slider, support rod and spring, and mounting said subassembly in operative position on 15 said case.

56. The method of claim 55 including assembling said spring by positioning the spring into a hollow end of said support rod.

57. The method of claim 56 including assembling 20 a pair of biasing springs into opposite ends of said support rod.

58. The method of claim 55 in which ~~said~~ spring is assembled and compressed within said support rod.

59. The method of claim 55 including assembling 25 slide actuators onto said support rod on opposite sides of said slider, and assembling said spring by securing said spring between said slide actuators in outwardly disposed relation to the support rod.

60. The method of claim 59 including securing 30 said spring in a tension between said slide actuators for biasing said actuators into engagement with opposite sides of said slider.

61. The method of claim 55 including mounting said subassembly into said case with snap action

engagement.

62. The method of claim 61 including mounting said support rod into mounting apertures in opposite side wall of said case.

5 63. The method of claim 55 including assembling said door onto said slider following mounting of said subassembly on said case.

64. A method of assembling a data information disk cartridge having a disk containing case defined 10 by a base and a pivotal cover and a spring biased door and slider mounted on a support rod for movement on said case between open and closed positions comprising the steps of assembling said door onto the support rod, assembling at least one biasing spring on said 15 support rod to form a subassembly comprising the slider, support rod and spring, and mounting said subassembly on said base with snap action engagement.

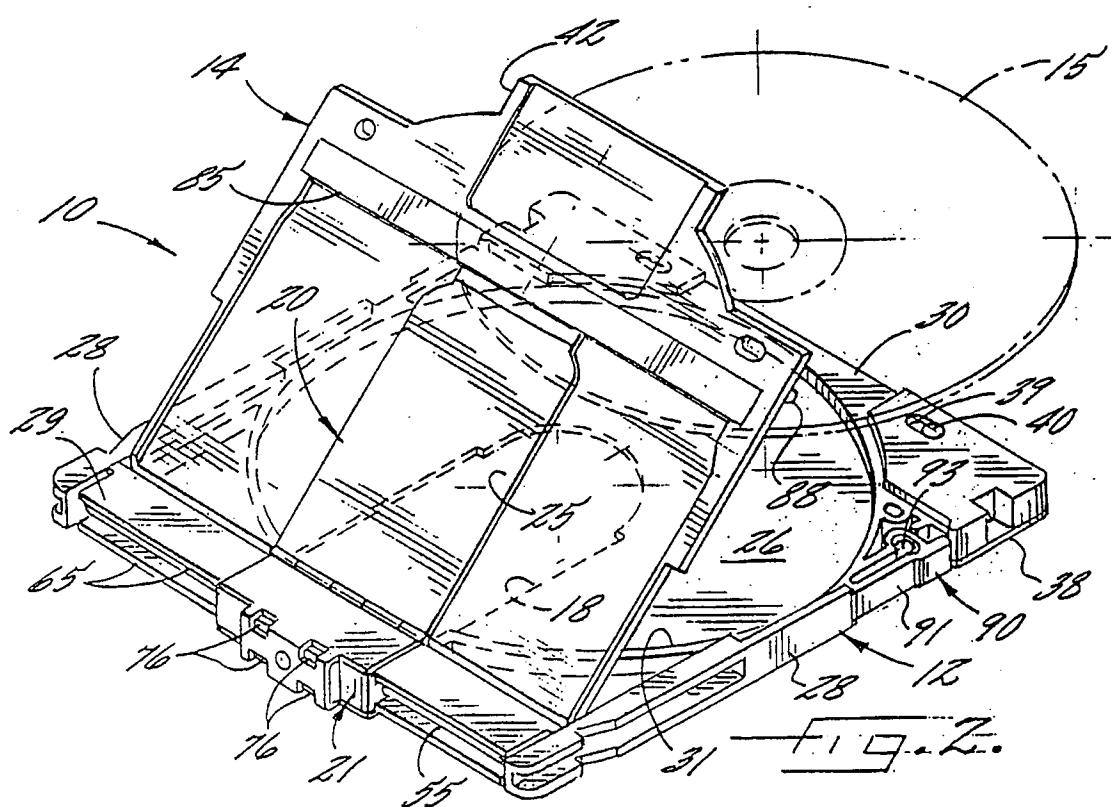
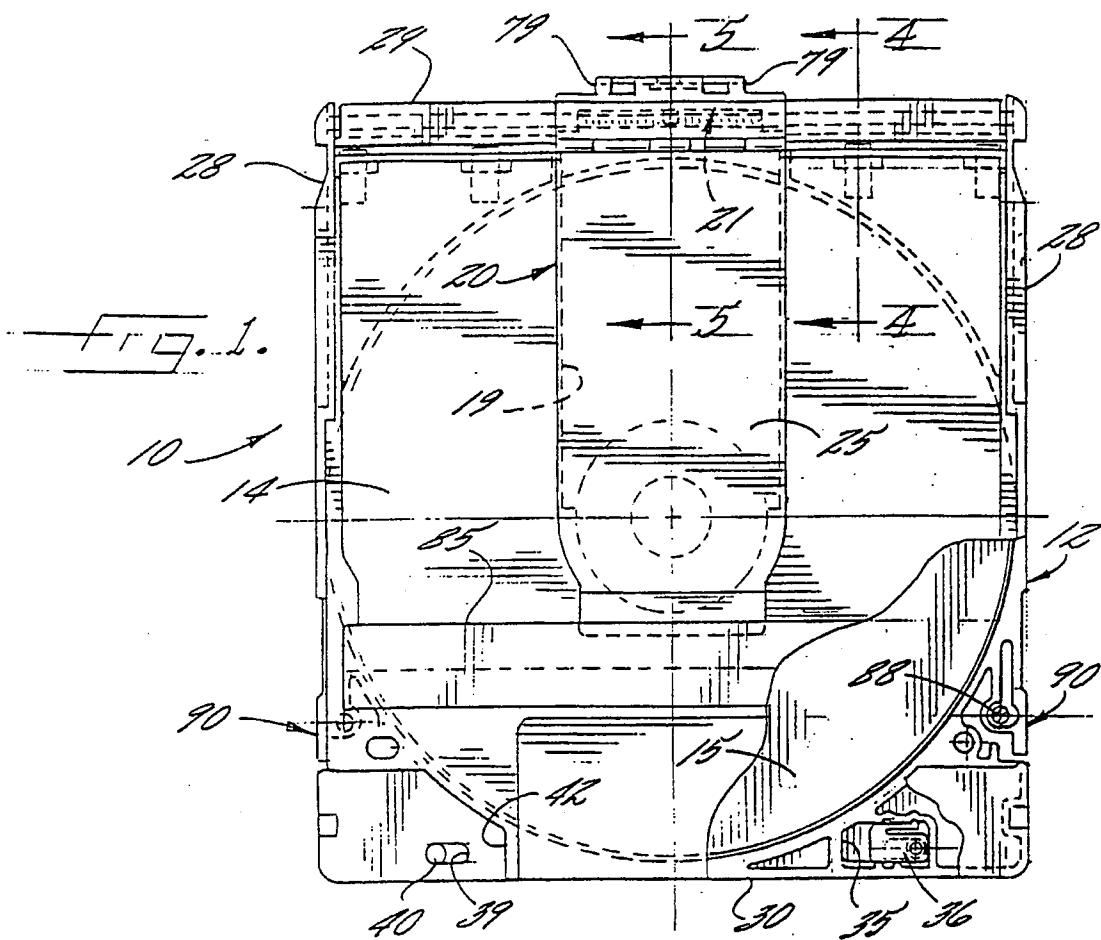
65. The method of claim 64 including mounting said door onto said slider with snap action 20 engagement.

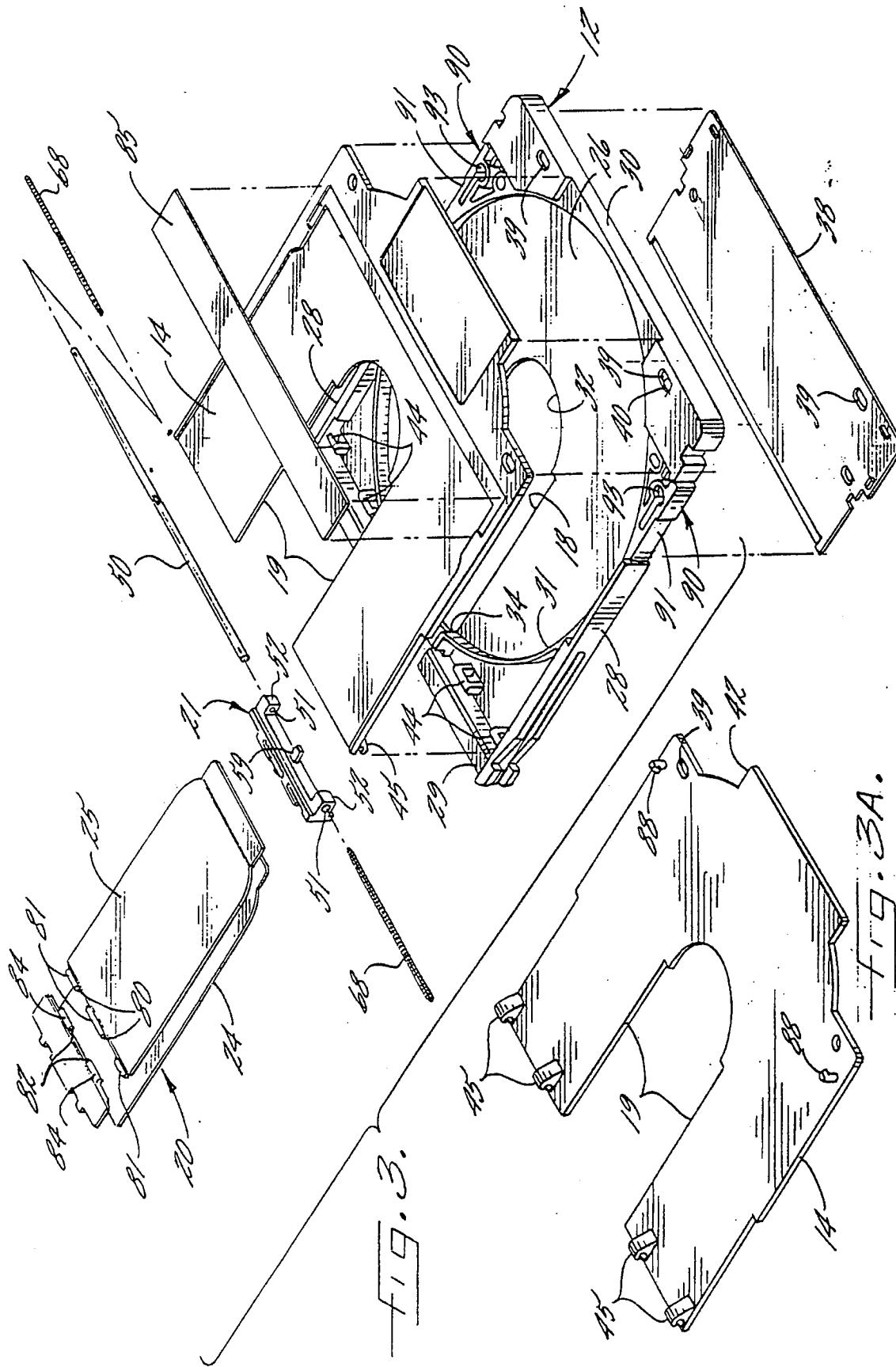
66. The method of claim 65 including mounting said cover on said base with snap action engagement.

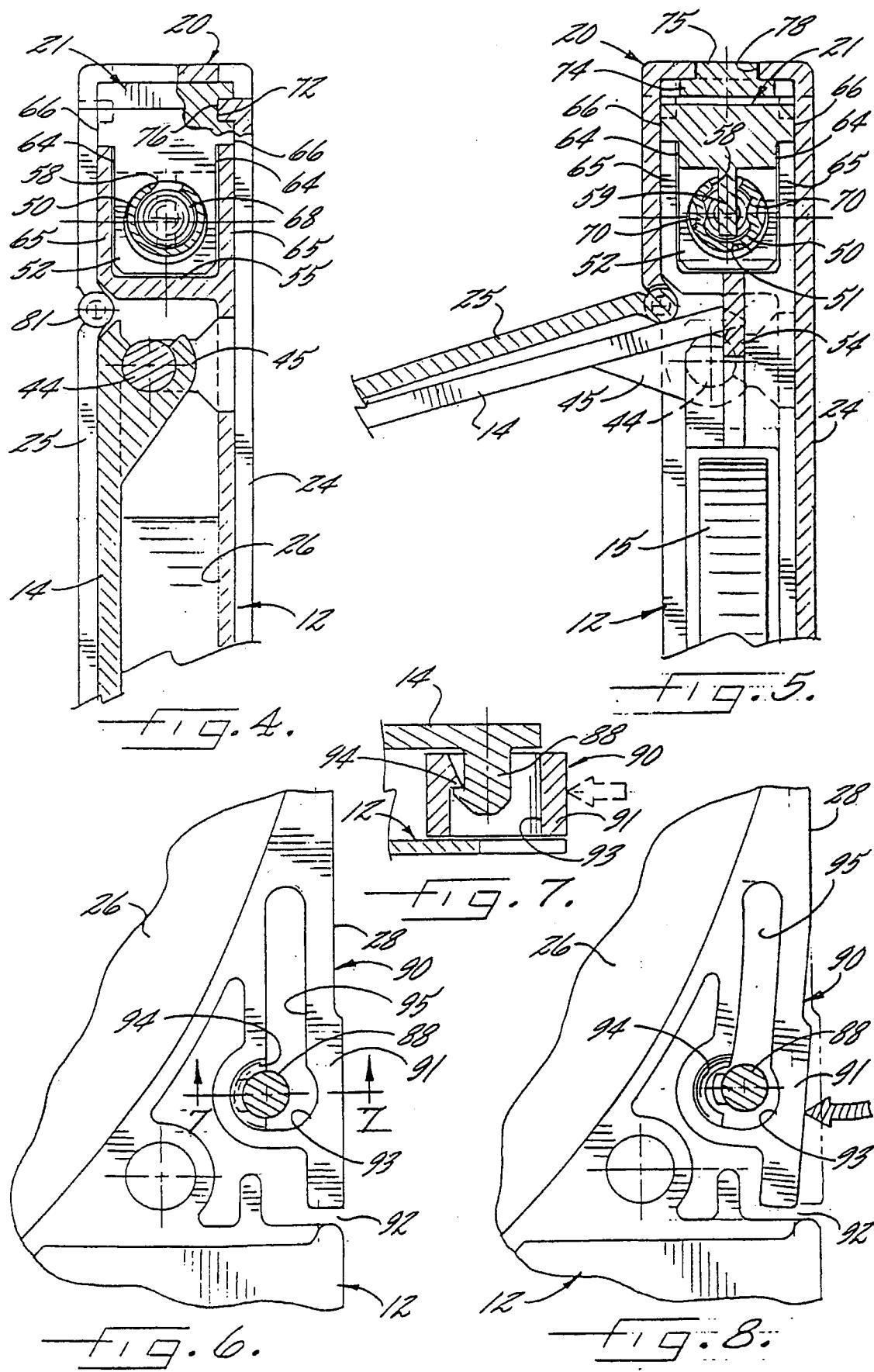
67. The method of claim 64 including assembling said spring within said support rod in compressed 25 condition between stops within said support rod.

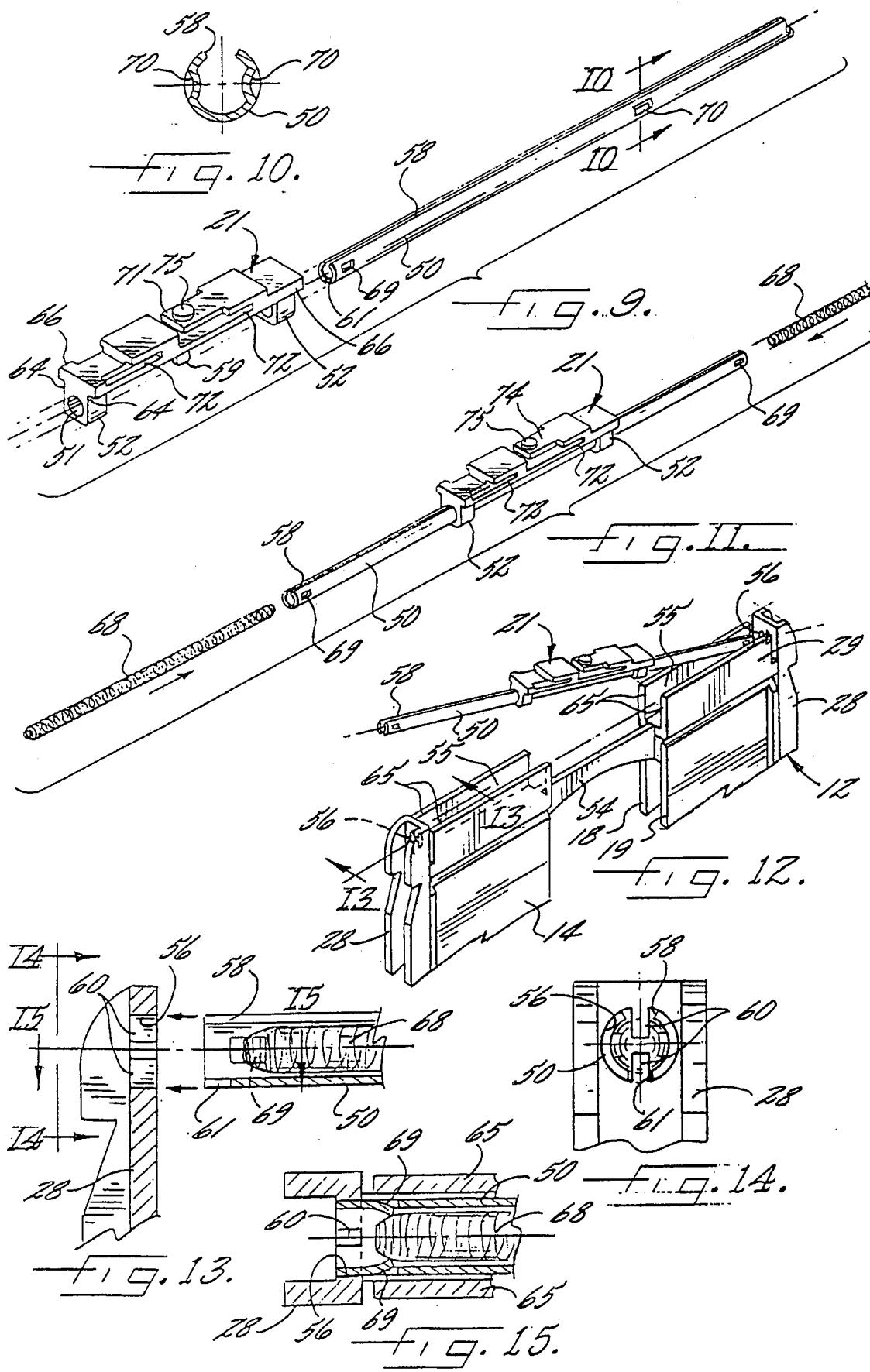
68. The method of claim 64 including pre- assembling slide actuators onto said support rod on opposite sides of said slider, and securing said spring in tension between said slide actuators in 30 outwardly disposed relation to the support rod.

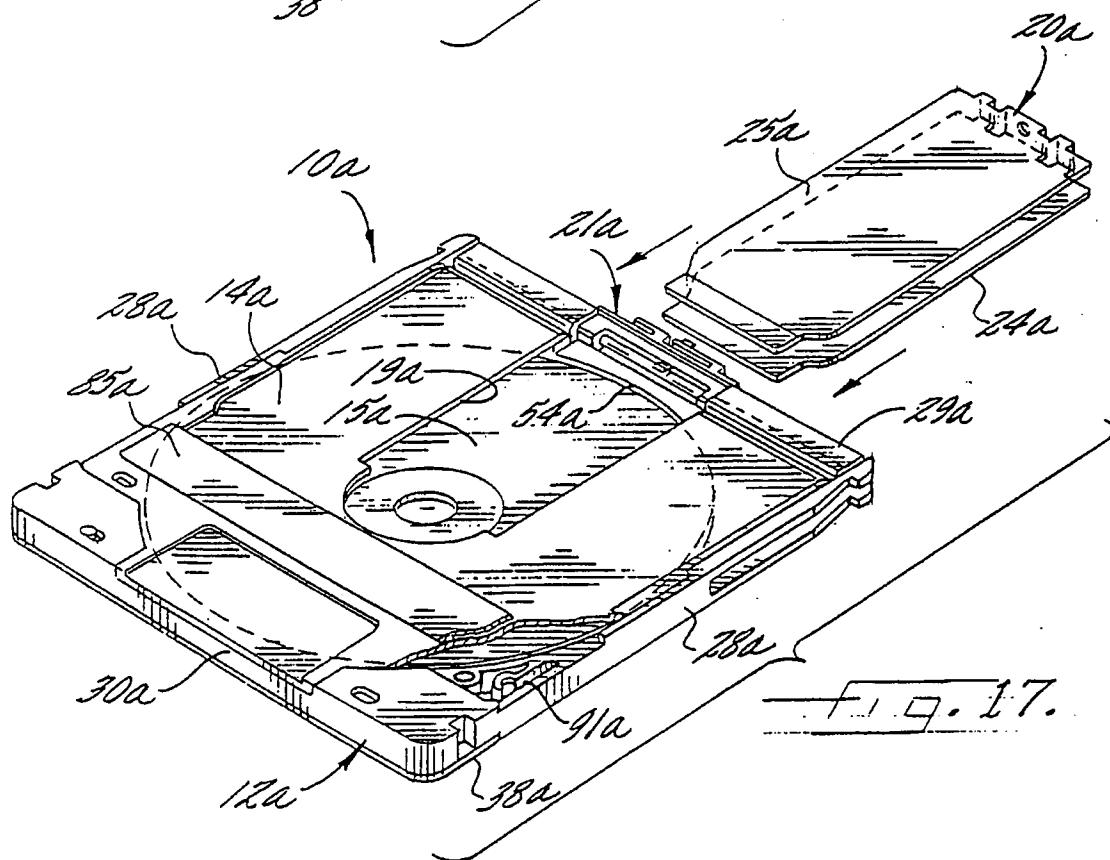
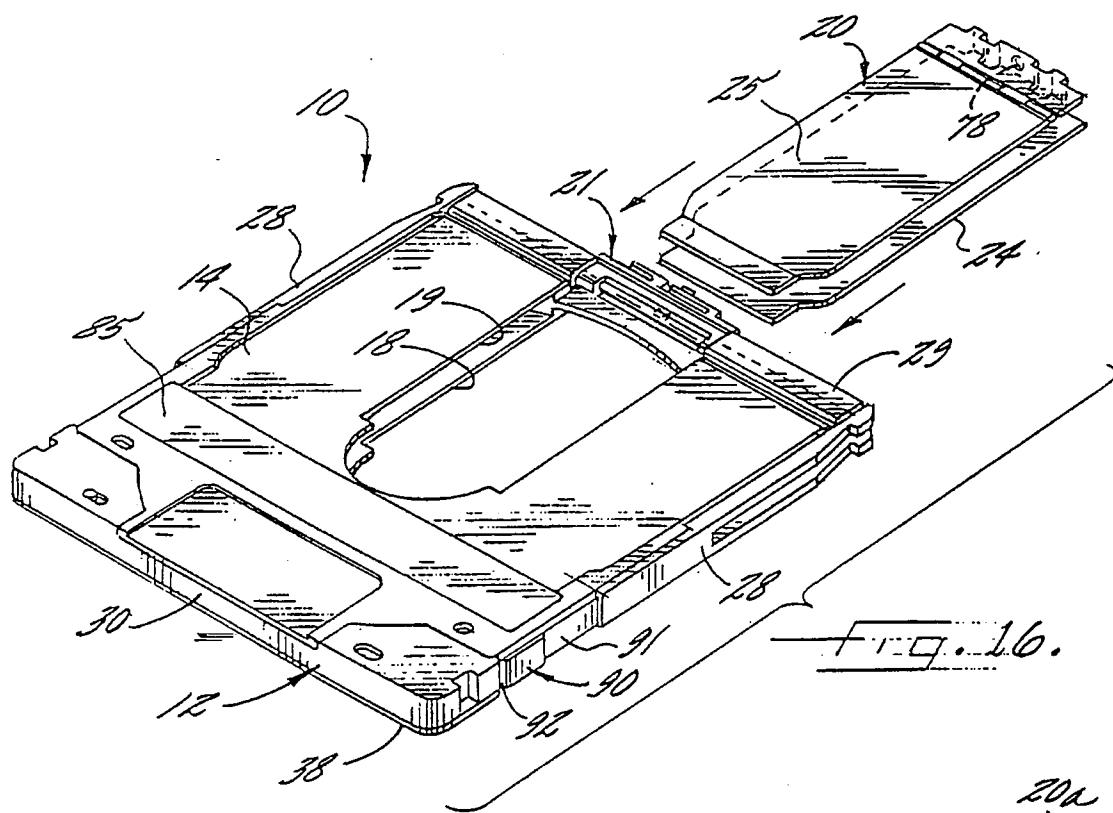
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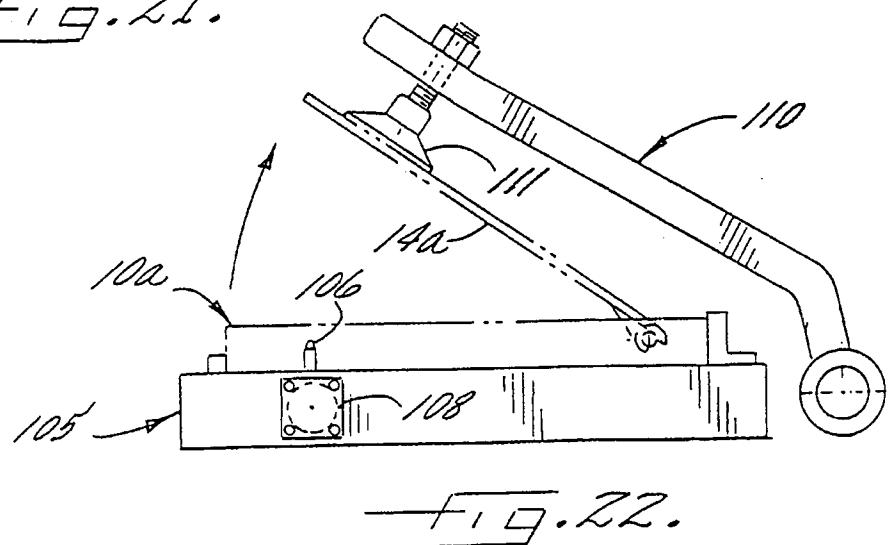
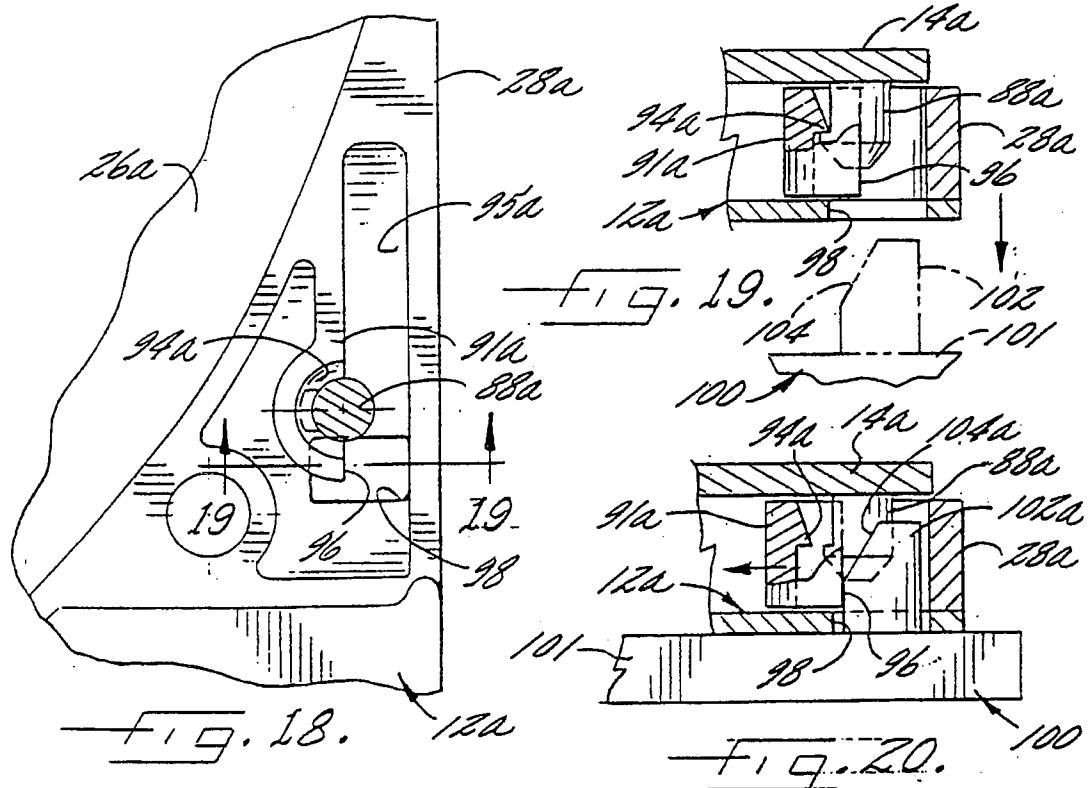




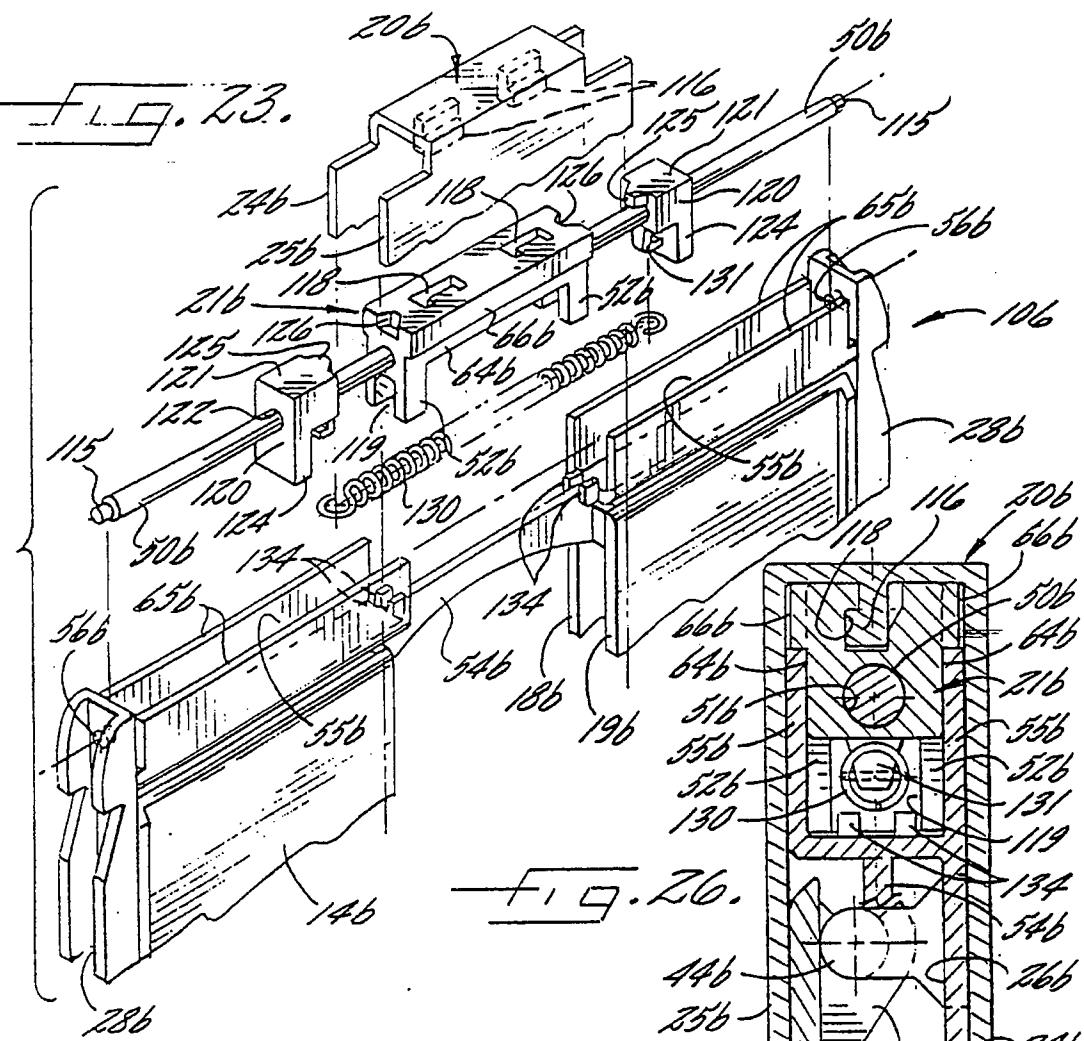








—FIG. 23.



—Fig. 26.

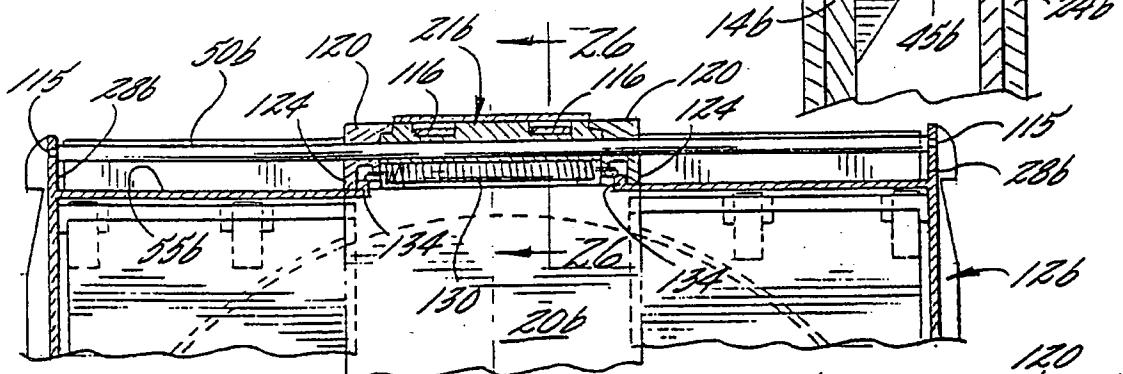


Fig. 24.

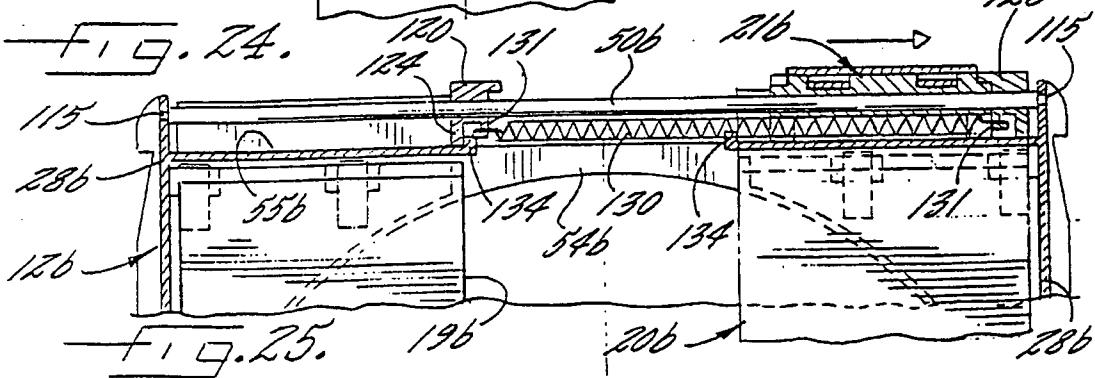


Fig. 25.

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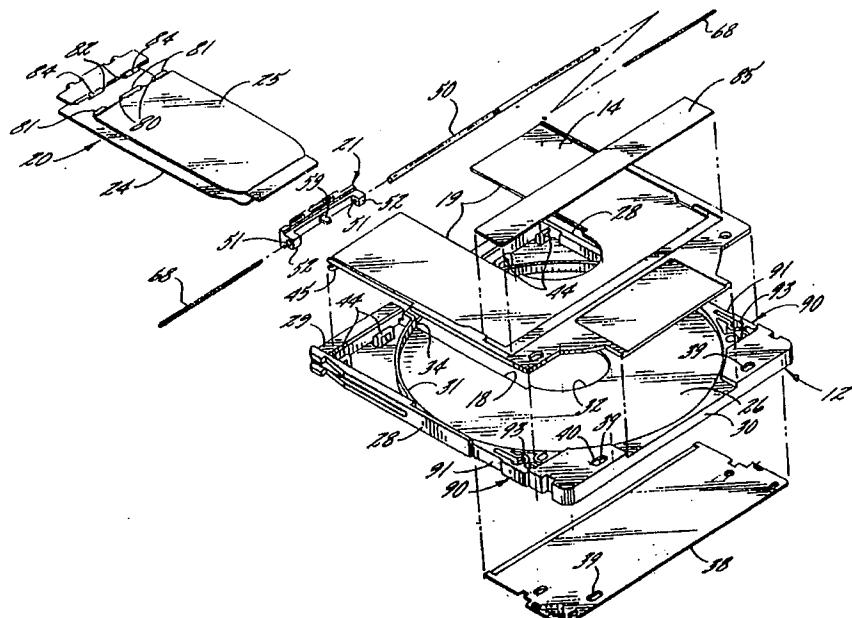
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: DATA INFORMATION DISK CARTRIDGE AND METHOD OF ASSEMBLY AND USE



(57) Abstract

A protective cartridge for a data information disk comprising a disk containing case and a door (20) moveable on the case between a closed position covering the disk and an open position for exposing the disk during read operations. The door (20) is supported on a subassembly comprising a slider (21), a support rod (50) upon which the slider (21) is mounted, and a biasing spring (68) for urging the slider (21) towards a door closing position. The subassembly is mountable as a unit with easy snap action engagement into the case. The cartridge case further is defined by a base (12) and a pivotal cover (14) that have respective interchangeable latch members (88, 90) which, for purposes of security, can be disengaged only by means of pre-formed pins or tools inserted into respective access apertures (93) formed in a bottom wall of the cartridge base (12).

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/03608

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G11B 23/03, 5/82; B65D 85/57
US CL :369/291, 292; 360/133; 81/3.07; 206/308.2

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 369/289, 291, 292; 360/133; 81/3.07, 3.08, 3.2, 3.25, 3.31, 3.32; 206/1.5, 307, 308.1, 308.2, 308.3, 309, 311, 312, 387.11, 807

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,093,823 A (OUWERKERK et al) 03 March 1992, col. 3, lines 38-65.	1, 13, 14, 16-21, 55, 61-63
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Y		64-67
X	US 4,746,013 A (SUZUKI et al) 24 May 1988, col. 1, lines 45-61, Figures 1-2.	30-41, 48-51
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Y		64-67

 Further documents are listed in the continuation of Box C. See patent family annex.

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- *O* document referring to an oral disclosure, use, exhibition or other means
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Date of the actual completion of the international search

09 JUNE 1998

Date of mailing of the international search report

18 AUG 1998

Name and mailing address of the ISA/US
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/03608

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 62-33382 A (TOSHIBA CORP.) 13 February 1987, Figures 1-3.	1, 7
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A		2-6, 8-12, 15, 56-58
A	US 5,488,605 A (ISHIMATSU) 30 January 1996, col. 5, lines.17-38.	22-29, 59, 60, 68
A	US 4,928,816 A (ZUSY) 29 May 1990, col. 3, lines 31-55.	42-47, 52-54

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/03608

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/03608

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claims 1-29, 55-68, drawn to a shutter mechanism and method of assembling the shutter mechanism.

Group II, claims 30-41, drawn to a movable latch in a disk cartridge.

Group III, claims 42-54, drawn to an apparatus and method for loading a disk in a cartridge.

The inventions listed as Groups I, II, and III do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Group I contains special technical features directed to the disk cartridge having a sliding door with a slider, support rod, and return spring, which features are not present in Groups II and III. Group II contains special technical features directed to a disk cartridge having a cover pivotally mounted on a base along with latch portions, which features are not present in Groups I and III. Group III contains special technical features directed to an apparatus for opening a disk cartridge wherein the apparatus has a pair of pins positionable into access apertures in the disk cartridge, which features are not present in Groups I and II.